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same denomination. The blocks in each row are numbered from left to right, and from zero to ten, while the longitudinal bars underneath have engraved upon them the denomination of the coils of that row. The connections of the coils are such that but one plug is required for each denomination. By inserting it in any block, as many coils of that denomination are thrown in as may be indicated by the particular number engraved upon the block. Thus, as the cut represents it, there are in circuit 369 ohms; i.e., no thousands, three hundreds, six tens, and nine units. Another feature of this set is the arrangement of the bridge-arms, which are seen at the left. These are combined with reversing-bars, so that the proportional arms may be instantly interchanged, — an operation which is necessary in many special methods. An additional advantage is, that but six coils are necessary in the bridge, instead of eight as usual, to get the proportion of 1 to 1,000, or 1,000 to 1, thus making the set smaller and more portable. The bridge-coils are 1, 10, and 100 on one side, and 10, 100, and 1,000 on the other. To effect this reversal, two plugs only have to be changed. The coils are platinoid wire, which has a very high specific resistance, and changing by but .0023 of one per cent for each degree Centigrade of temperature variation. They are adjusted by Professor William A. Anthony to an accuracy of from one fifth to one-tenth of one per cent, while the bridge-arms themselves are adjusted to a still higher degree of accuracy. The galvanometer is a successful adaptation of a laboratory instrument to the needs of portable work, and is claimed to be the most sensitive, complete, and portable instrument ever combined in a set of this character. The wire is of several hundred ohms resistance, and is wound so as to have a maximum effect upon the needle. The needle itself is an astatic one, and delicately suspended by a very fine cocoon fibre, so that there is practically no resistance to any deflecting force. By means of a very weak controlling magnet sliding upon the suspension-tube, the needle can be made almost perfectly astatic, and will show an appreciable deflection for currents as small as from $\frac{1}{50000}$ to $\frac{1}{20000}$ of an ampère. The brass box containing needle and coil is movable about a vertical axis; so that the needle can always be brought to zero, whatever the position of the box as a whole. The whole galvanometer lifts out of its position in the case, and can be used independently, or in connection with other apparatus if desired, three levelling-screws being provided for levelling when so used. By closing the cover of the box, the weight of the needles is automatically taken from the fibre, and the latter protected from injury. The battery and galvanometer-key are seen in the front of the box, and are independent of each other. The whole is mounted up in a polished mahogany box with leather handles and lock and key, and measures when complete but 18 inches long by $6\frac{1}{2}$ inches broad. Fig. 2 is a cut of the same thing without the galvanometer, and it is of course somewhat shorter. These sets have a range of measurement from $\frac{1}{10000}$ of an ohm to 10 megohms.

Fig. 3 shows one of the other sets of the series, and is of much the same general character. The coils, instead of platinoid, are made of German silver, and are not quite so accurately adjusted, while the set is without the reversing arrangement found in the ones just described. The galvanometer also is fibre-suspended, but without the automatic release. For this purpose a small set screw is used, which allows the needle to be lowered when not in use. The galvanometer is permanently mounted in the case, and is without the control-magnet. The keys are combined into the regular double contact form. This set, as represented in the cut, has but three rows of resistance; viz., the units, tens, and hundreds. It is also made with an additional row of thousands. This set is also made without the galvanometer.

MESSRS. R. T. HILL and J. S. STONE have recently made some important explorations in southern Indian Territory,—a region about which little has hitherto been known geographically or geologically. They find that the Indian Territory is divided into distinct northern and southern divisions by the Ouachita mountain system. The southernmost of these divisions has been the special object of their studies, and they have secured most valuable data concerning it, as well as the history of the medial portion of Red River, which has not hitherto been investigated.

THE CHEROKEES IN PRE-COLUMBIAN TIMES.

III.

[In *Science* of May 30, p. 324, in the previous article on this subject, Fig. 3 is incorrect. The correct figure will be given in the revised edition of these papers when published in book form.]

SUMMING up the evidence introduced, it leads to the following conclusions:—

1. That some of the Cherokees reached their historic seat before the year 1540, probably as early as the latter part of the thirteenth century.
2. That they came from some point to the north or north-west, apparently in the region of the Ohio River.
3. That some, if not all, of the mounds of western North Carolina and East Tennessee were built by the people of this tribe.

Assuming these points to be sufficiently established, let us see what evidence can be adduced indicating their line of migration.

If their former home was in the region of the Upper Ohio, and they stopped for a while on New River and the head waters of the Holston, their line of retreat was in all likelihood up the valley of the Great Kanawha. This supposition agrees also with the fact that no traces of them are found in the ancient works of Kentucky or middle Tennessee. In truth, the works along the Ohio River from Portsmouth (except those at this point) to Cincinnati, and throughout northern Kentucky, are different from the typical works of Ohio, and most of them of a type found in no other district. On the other hand, it happens, precisely in accordance with the theory advanced, that we find in the Kanawha valley, near the city of Charleston, a very extensive group of ancient works, stretching along the banks of the stream for more than two miles, consisting of quite large as well as small mounds, circular and rectangular enclosures, etc. A careful survey of this group has been made, and a number of the tumuli, including the larger ones, explored by the representatives of the Bureau of Ethnology.

The result of these explorations has been to bring to light some very important data bearing upon the present question. In fact, the discoveries made here seem to furnish the connecting link between some of the works of Ohio and those of East Tennessee and North Carolina ascribed to the Cherokees.

Subsequent to the preparation of the paper on the "Burial-Mounds of the Northern section," published in the "Fifth Annual Report of the Bureau of Ethnology," further explorations and a careful resurvey of the group near Charleston were made. In order to show the bearing of the data obtained on the questions involved in this discussion, it is necessary to give somewhat detailed descriptions of some of the mounds explored.

Mound 15 of this group (for convenience the numbers in the original sketch are used) was sixty-five feet in diameter and five in height, though a considerable portion had been ploughed off in cultivating the soil. In the top was a basin-shaped fire-bed somewhat oval in outline, being about seven feet long and four feet wide. This was composed of a mixture of clay and ashes burned to a brick red on the upper side; but the under side had a black, greasy appear-

ance. Below this was a similar bed, on and about which were numerous small fragments of bones, but too much broken and charred to show whether they were human or animal.

These basin-shaped beds remind us of those of similar form found in the mounds of East Tennessee, and present one indication of relationship between the mound-builders of the two sections.

Mound No. 18, about the same size as the preceding, contained a similar series of basin-shaped fire-beds, lying one below the other in the central portion. Below them, near the bottom of the mound, was a considerable bed of charcoal and ashes; and immediately under this, on the original surface of the ground, the fragments of a skeleton, with which were a number of broken arrow and spear heads.

Mound No. 1 of the group is of large size, measuring five hundred and twenty feet in circumference and thirty-three in height. This was explored by sinking a shaft twelve feet square to the bottom. At the depth of from three to four feet, in a bed of mixed clay and ashes, were three skeletons lying extended on their backs, doubtless intrusive burials. From this point downwards for twenty feet, nearly all of the material in the shaft consisted of the same mixed substances, so hard as to require the constant use of the pick. At the depth of twenty-four feet there was a sudden change to a much softer and darker-colored earth, in which were the casts and decayed fragments of poles and logs from six to twelve inches in diameter. These, together with fragments of bark, ashes, and animal bones which had been split lengthwise, continued through a layer of about six feet. At the depth of thirty-one feet a human skeleton was discovered lying prostrate, head north, the skull crushed but partly preserved by contact with a sheet of copper (only fragments of which remained) that probably once formed part of a head-dress of some kind. By enlarging and curbing, the shaft was extended to a diameter of sixteen feet. It was then found that a layer of elm-bark had been carefully spread, with the inner side up, upon the smoothed and well-packed surface of the ground. This had been covered with a layer a few inches thick of fine white ashes. On this the body was laid, and covered with similar bark.

Ten other skeletons, all buried in the same manner, were found at this point, arranged, five on each side, in a semi-circle around the central one just mentioned, with feet turned toward it. With each skeleton on the east side of the centre was a fine, apparently unused lance-head; and by the side of the northern one of these five, a fish-dart, three arrow-points, and some decayed mussel-shells. Nothing was found with the other five. With the central one, in addition to what has been mentioned, were six shell beads and a large lance-head.

But what interests us more at present is the fact that near the head of the latter was a conical vault of very hard clay, about four feet high and five feet in diameter. This was partially filled with rotten bark, human bones, and dark, decomposed matter. Immediately under this, but covered with clay, were two circular holes about sixteen inches in diameter, and four feet deep. A similar pair of holes was found at the head of each of the ten surrounding skeletons, ranging in depth from two to three feet, and in diameter from eight to twelve inches.

The little beehive vault, resembling so exactly in form and size those of North Carolina, although built of clay, is another indication of relationship between the mound-builders of the two sections. On the other hand, the burial between the layers of bark is precisely what is often found to be the case in the Ohio mounds, as appears from the following statements by Messrs. Squier and Davis in "Ancient Monuments:" "The course of preparation for the burial seemed to have been as follows: the surface of the ground was first carefully levelled, and packed over an area perhaps ten or fifteen feet square. This area was then covered with sheets of bark, on which, in the centre, the body of the dead was deposited, with a few articles of stone at its side, and a few small ornaments near the head. It was then covered over with another layer of bark, and the mound heaped above."

The individual or skeleton buried in the conical vault had probably been wrapped in bark.

That there was a wooden structure of some kind covering the area occupied by the skeletons is more than probable, as thus only can we account for the timbers. The holes mentioned may indicate the position of a former structure, but this had been removed before the burials took place. It would seem that most, if not all, of the burials took place at one time, and after the flesh had been removed.

Mound 21, known locally as the "Great Smith Mound," is the largest of the group, being a regular cone, thirty-five feet high, and one hundred and seventy-five feet in diameter at the base. This was explored by sinking a shaft to the bottom twelve feet in diameter. It is a double mound, or mound of two stages. The first building carried it to the height of twenty feet: after a considerable time had elapsed, another stage of work carried it to its present height. Near the top were some skeletons, probably intrusive burials. At the depth of twelve feet the explorers began to find the fragments and casts of logs, the first being that of a black-walnut log, which must have been nearly twelve inches in diameter and several feet in length. Further excavation made it apparent that these timbers were the remains of a wooden vault about thirteen feet long and twelve feet wide. From all the indications,—the casts of the posts and logs, the bark and clay lining, the fallen timbers, the bark of the roof, etc.,—it was inferred that the vault was constructed as follows: after the mound, which was at this time twenty feet high, had been standing for an indefinite length of time, a square pit, twelve by thirteen feet, was dug in the top to the depth of six feet; posts were then placed along the sides and ends, the former reaching only to the surface, but the central ones at the ends rising four feet higher; on the latter was placed the ridge-pole (the walnut log first encountered); the sides were plastered with a mixture of clay and ashes, and possibly lined with bark; the roof, which had fallen in, was made of poles, and covered with bark; over all was heaped the superincumbent mound fifteen feet in height.

In this vault were five skeletons, one lying prostrate on the floor at the centre. The other four had been placed, one in each corner, apparently in an upright position. All had been wrapped in bark. The central skeleton was very large, measuring a little over seven feet in length. Each wrist was encircled by six heavy copper bracelets. A fragment of the wrapping, preserved by contact with the copper, shows that it was black-walnut bark. A piece of dressed skin,

which had probably formed the inner wrapping, was also preserved by the copper. Upon the breast was a copper gorget; by each hand were three flint lance-heads; near the right hand, a small hematite celt and a stone axe. Around the head, neck, and hips were about one hundred small, perforated sea-shells and some shell beads. Upon the left shoulder, lying one upon another, were three sheets of mica from eight to ten inches long, six to seven in width, and half an inch thick.

Further discoveries of badly decayed skeletons were made in carrying the shaft downward below the vault, but nothing with which we are at present concerned except the fact that among the articles obtained was the steatite pipe shown in Fig. 8.

The significance of this mound lies in the close resemblance it bears, in some respects, to the Grave Creek mound, which, according to the tradition of the Cherokees, was built by their ancestors. But at present no argument is based upon this part of the tradition. This latter giant tumulus is in the form of a regular cone, seventy feet high, and nearly three hundred in diameter at the base. A shaft sunk from

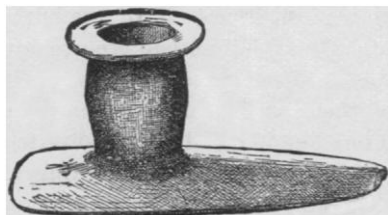


FIG. 8.

the apex to the base disclosed two wooden vaults,—the first about half way down, and the other at the bottom. In the first or upper one was a single skeleton decorated with a profusion of shell beads, copper bracelets, and plates of mica. The lower vault, which was partly in an excavation made in the natural ground, was rectangular, twelve by eight feet, and seven feet high. Placed close together along each side and across the ends of the excavation were upright timbers or posts, which supported others thrown across to form the roof. In this vault were two human skeletons, one of which had no ornaments, while the other was surrounded with hundreds of shell beads. In attempting to enlarge this vault, the workmen discovered around it ten other skeletons.

The similarity in the method of constructing the vaults is marked and peculiar. Wooden vaults are not uncommon; but those partially sunk in a pit, with the sides and ends formed of upright posts, are very rare, and are probably due to some peculiar custom, and indicate tribal identity of the builders. We notice also the presence, with one of the skeletons in each mound, of copper bracelets and plates of mica. In both a vault is built about midway the height.

Mound 31 of the Kanawha group presents some striking resemblances to the so-called sacrificial mounds of Ohio. It is somewhat flattened on top, three hundred and eighteen feet in circumference at the base, and twenty-five feet high. After passing through the top layer of soil, some two feet thick, a layer of clay and ashes one foot thick was encountered. Here, near the centre of the shaft, were two skeletons lying horizontally. These were probably intrusive

burials. At the depth of thirteen feet, and a little north of the centre of the mound, were two large skeletons in a sitting posture, with their extended legs interlocked to the knees. Their arms were extended and their hands slightly elevated, as if they were together holding up a sandstone mortar which was between their faces. At the depth of twenty-five feet, and resting on the natural surface of the ground, was one of the so-called "altars," precisely similar to those found in some of the Ohio mounds. This, which was thoroughly traced, was found to be twelve feet long and a little over eight feet wide. It consisted of clay, apparently slightly mixed with ashes, the middle portion basin-shaped, and the margins sloping downwards and outwards; in other words, it was a typical "altar," similar to that shown in Fig. 32, "Ancient Monuments." The depth of the basin in the centre was a little over a foot, and the thickness of the bottom at this point about six inches. On this rested a compact layer of very fine white ashes from one to two feet thick, entirely covering this clay bed. Scattered through them were many water-worn boulders from three to five inches in diameter, all bearing indications of exposure to intense heat; also fragments of charred bones, some of which were nearly destroyed by heat. The upper side of this clay bed or "altar" was burned to a brick red.

That this tumulus must be classed with the (so-called) "sacrificial mounds" of Ohio, will, it is presumed, be admitted without any objection. As the custom of building these clay structures, to which Messrs. Squier and Davis applied the name "altars," seems to have been peculiar to one class of Ohio mound-builders, we have here one very strong indication that the people who built the mounds of this Kanawha group belonged to the same tribe.

Mound 23 is of considerable size, measuring three hundred and twelve feet in circumference and twenty-five in height. It had never been disturbed in any way, and was the most pointed and symmetrical of the group.

As the discoveries made in it are important in this connection, the report of the Bureau explorer is given somewhat fully.

It was examined by sinking a large central shaft to the bottom. From the top to the depth of fifteen feet, the material passed through was an exceedingly hard, gray mixture, apparently of ashes and clay. At this depth casts of poles and timbers of various sizes were discovered, but all less than a foot in diameter, extending into the western and southern sides of the shaft. These casts and rotten wood and bark continued to increase in amount nearly to the natural soil, which was reached at the depth of twenty-five feet. The *débris* being removed, and the bottom of the shaft enlarged to fourteen feet in diameter, it was ascertained that these timbers had formed a square or polygonal vault, twelve feet across, and some eight or ten feet high in the centre. This had been built up in the form of a pen, the ends of the poles extending beyond the corners. The roof must have been sloping, as the ends of the poles used in making it extended downward beyond the walls on which they rested. On the floor of this vault, which corresponded with the original surface of the ground, were two adult skeletons, the bones of which, though but little decayed, were crushed and pressed out of position. No implement or ornament was found with them.

As the earth of this floor did not appear to be the natural soil, the shaft was carried down four feet farther. This revealed a pit, the lateral extent of which could not be determined, but which had been dug to the depth of four feet in the original soil. On the floor of this pit, at one side, arranged in a semicircle, were six small clay vaults in the shape of beehives, about three feet in diameter at the bottom, and the same in height.

They were made of clay and ashes mixed, very hard, and impervious to water. Possibly they had been allowed to dry before being covered with earth. They were partially filled with a dark, dry dust, apparently of some decayed substance. A few fragments of bones were found in them.

In the centre of the space around which these little vaults were arranged, but only two feet below the floor of the large wooden vault, were two small clay-lined cavities about the size and form of the ordinary water-jars from the Arkansas mounds. Possibly they were decayed, unburnt vessels which had been deposited here at the time of burial.

The bottom of the pit, which consisted of the natural deposit of yellow sand, was covered with a layer of charcoal and ashes two or three inches thick. This sand appeared to have been heated, from which it is inferred that the burning took place in the pit previous to the formation of the vaults.

The work was suspended at this stage, on account of extreme cold weather, but was recommenced the following season by running trenches from the sides into the shaft, and afterward carrying a tunnel in at the base. In one of these trenches, nine feet from the top, occurred a layer of soft earth, in which were numerous fragments of decayed timbers and bark, also casts of logs extending horizontally into the sides of the trench. These, it is presumed from what was afterward discovered, pertained to a wooden burial-vault. The tunnel carried in at the base was from the south side, ten feet wide, and eight feet high. For a distance of twenty feet it passed through the hard gray material of which the body of the mound was composed. Here the explorers suddenly encountered a deposit of soft earth in lenticular masses and of various colors, showing that it had been brought from the hillsides and bottoms near by. A short distance from this point they began to find the casts and remains of the timbers of the large central vault, but, before reaching the interior, passed over a small refuse-heap, evidently belonging to an age preceding the date of the building of the mound. As they entered the remains of the vault, they began to find tolerably well preserved human bones, but no whole skeletons. Seeing here indications of the pit before mentioned, the tunnel was carried downward four feet, disclosing five little clay vaults similar to those found on the other side, and, like them, placed in a semicircle. It was now decided to remove and thoroughly explore about one-half of the mound. Many stone implements, some entire but most of them broken, seemingly by the action of fire, were scattered through the hard upper layer; also numerous single valves of mussels which had been used as digging-tools until they were worn from the outside entirely through.

There was a marked dissimilarity between the northern and southern sides of this mound, the former being a compact mass of variously colored soils from different points in the vicinity, in alternate horizontal layers. The separate

loads of the individuals who carried this earth were plainly defined; and the different sizes of these small masses indicate that many persons, some much stronger than others, were simultaneously engaged in the work.

With the exception of the imperfect or broken specimens mentioned above, no remains of any kind were found in that portion of the mound above the fire-bed and north of the central shaft, and only two skeletons beneath it; while many interesting finds of implements were made all through the loose, ashy dirt of the southern part, and many skeletons below it. The amount of rotten wood and bark observed, and the positions of the casts of logs and poles, some of which extended downward four feet below the natural surface of the ground, render it probable that there was a wooden structure here twelve feet square and three stories high, or, what is more likely, three structures, one above another.

A foot above the natural surface, or twenty-four feet from the top of the mound, was a smooth horizontal layer of sand and ashes, interrupted by two heavy fire-beds. These beds were circular in form, eight feet in diameter, and about ten feet apart. The earth was burned hard for eight inches below the ashes. Under these beds were several human skeletons.

No. 1, a medium-sized adult, was extended on the back, head south, arms by the side. This was four feet below the centre of the northern fire-bed. No trace of a coffin was observed, but a rude hoe and a rough lance-head were at the left side.

No. 2 was four feet north of No. 1, at the same depth. It lay with the feet toward the centre of the mound, and was enclosed in a kind of coffin formed by leaning flat stones together over the body in the form of an inverted V, and placing a similar stone against the end at the head. A number of relics were with this skeleton, and on the stone at the head was a hematite celt. Two feet north of the head were the fragments of a large clay vessel.

No. 3, similarly placed, was four feet under the north edge of the other fire-bed. Some relics were found above the head, and others in a small conical vault near the left side.

No. 4, same depth as the preceding, had the head toward the centre of the mound. A small vault near the head contained several relics of different sorts.

Nos. 5 and 6 lay near together, with heads south. There was a small vault near the feet of the smaller skeleton.

None of these skeletons were found immediately in the centre of the mound, and all were about four feet below the natural surface of the ground, resting on the bottom of the pit, as were the little conical vaults. Nine vaults in addition to those mentioned were unearched,—four of them on the bottom of the pit, and five above it. They were similar in form and size to those heretofore described. There was one toward the south side of the pit elongate in form, and not more than two feet wide and two feet high.

Another mound, numbered 30 in the original plat, had a circular pit beneath it, in which were several beehive-shaped clay vaults similar to those heretofore mentioned. The explorer, however, in this case, fails to mention the arrangement or to note particularly the contents, owing perhaps to the pit being partially filled with water, which prevented a thorough examination.

By a careful comparison of the discoveries made in the mounds of this Kanawha group with those made in the mounds of the Cherokee section, the reader will observe some striking similarities which cannot be easily accounted for upon any other theory than that of tribal identity or intimate relations of the peoples of the two sections. It is true that we find enclosures in the former locality, and none in the latter, and it is also true that we notice other dissimilarities; but some changes in customs and works are to be expected where there is a change of location. Necessities, materials, and environments are different, and bring about modifications of customs. These changes are apparent in all parts of the mound area, even where there are good reasons for attributing the works to the same people: in fact, they are sometimes found in a single group.

It is true, we cannot assert positively that the little conical clay vaults above described, except in one or two cases, were depositories of the dead, as were the conical boulder vaults of North Carolina and East Tennessee; yet the very marked similarity in form and size, and correspondence in their arrangement in the tumuli, justify the belief that there was a relationship between the authors of the works of the two sections. Not only are they similar in size and form, but in both localities pits were dug in the original soil, the floor was covered with coals or ashes in some cases, and the vaults built on these and the mound heaped over them. It should also be borne in mind that vaults of this kind, arranged as here stated, have so far been found only in these two sections. The arrangement in a circle found in the mound in Sullivan County, Tenn., has its parallel in one of the mounds of the Kanawha group. In one was also found the pipe shown in Fig. 8; in the other, that shown in Fig. 5.

In further corroboration of the theory of relationship between the people of the two sections, may be mentioned the fact that in the mounds of both we find the peculiar basin-shaped beds placed in series one above another.

CYRUS THOMAS.

[To be continued.]

NOTES AND NEWS.

LIEUT. J. P. FINLEY, of the United States Signal Corps, has gone to San Francisco to take charge of the Pacific Coast Weather Service.

—Professor John C. Branner, State geologist of Arkansas, delivered a course of lectures on geology to the senior and junior classes at the Rose Polytechnic Institute, Terre Haute, Ind., week before last.

—Dr. William K. Newton of Paterson has resigned as dairy and food commissioner of New Jersey. This was done two months since to the State Board of Health, which, on the 6th of May, appointed one of Dr. Newton's assistants, Mr. George W. McGuire of Trenton, to fill the vacancy.

—We learn from *Nature* that Professor Von Nordenskiöld lately announced to the Stockholm Academy of Sciences that a scientific expedition would start during the summer for Spitzbergen. Among the party will be his son, M. G. Nordenskiöld, and MM. Klinckowström and Bahaman. The expenses of the expedition will be defrayed by Baron Dickson and M. F. Beijer, the publisher.

—A statistical investigation of lightning-strokes in central Germany, covering a period of twenty-six years, has been carried out by Herr Kastner. According to *Nature*, the number of cases has increased about 129 per cent, and last year (1889) it amounted to 1,145. The author distinguishes four thunder-storm paths.

The starting-points of all these are in hills, and in their course the woodless districts and flat country, the river-valleys, and low meadow-ground about lakes, seem specially liable, while the wooded and hilly parts generally escape. The hottest months (June, and especially July), and the hottest hours of the day, or those immediately following them (3 to 4 P.M.), show the most lightning-strokes.

—We learn from *Humboldt* that in connection with the tenth international medical congress, to be held this year in Berlin from Aug. 4 to Aug. 9, there is to be an international medico-scientific exhibition. The following kinds of objects will be exhibited: new or improved scientific instruments and apparatus for biological and especially medical purposes, including apparatus for photography and spectrum analysis so far as they are of service to medicine; new pharmaceutical and chemical stuffs and preparations; new or improved instruments for operative purposes of medicine, including electrotherapy; new plans and models of hospitals, convalescent homes, disinfection arrangements, baths, etc.; new arrangements for care of the sick, including means of transport, and baths for invalids; newest apparatus for hygienic purposes, etc. Communications (marked "Ausstellungsangelegenheit") should be sent to the office of the congress, Dr. Lassar, Berlin, N.W., Karlstrasse 19.

—The daily and yearly variation, and the distribution, of wind-velocities in the Russian Empire have been fully investigated by Kiersnowski, says *Nature*. The highest velocities (mean 6.3 metres per second) occur in the Baltic provinces. On the White Sea, on the Caspian, in the region of the North Russian lakes, and on the Steppe, the values are also high; in the forest region and the Caucasus they are low. Towards the interior of Asia the velocity decreases, and in Transbaikalia is the minimum (1.5 metres per second). Farther east, towards the Pacific, the velocity increases. In the annual period, the maximum is pretty uniformly in winter, the minimum in summer. A maximum in spring, and a minimum in summer or autumn, are peculiar to the Caspian region, the Ural, and West Siberia, with Central Asia. In eastern Siberia the minimum is in winter. The daily variation shows distinctly the connection with cloudiness. The greatest amplitude occurs in the brighter part of the year: in East Siberia in winter, and in the rest of the country in summer. In general, the amplitude increases regularly with the clearness of the sky eastward, and on land it is greater than on the sea.

—In seven years, experiments at the Ohio Agricultural Station with deep and shallow planting of corn show an advantage in favor of planting one inch rather than two inches deep, but indicate that in dry seasons it may be better to plant two inches deep. The greatest amount of marketable corn has been produced where the stalks averaged twelve inches apart. The variations in yield were slight, whether planted one grain every twelve inches, two every twenty-four, three every thirty-six, or four every forty-eight inches. Three years' trial has not indicated any marked differences in the reproductive qualities of corn from the butts, middles, or tips of the ears. If there is any variation, it is in favor of middles and tips, and against the butts. The experiments of 1888 and 1889 indicate that corn should be cultivated more frequently in a dry season than in a wet or ordinary one. The average results of two years' experiments favor deep cultivation rather than shallow. The implements used were the harrow and cultivator for shallow tillage, and the double shovel for deep. This work was under the care of J. Fremont Hickman.

—The papers read at the May meeting of the Royal Society of Canada included, in the section on mathematical, physical, and chemical sciences, "The Unit Measure of Time," by Dr. Sandford Fleming, president of the section; "Tidal Observations in Canadian Waters, the Present Condition of the Question," by Professor A. Johnson, McGill University, Montreal; "Sunspots observed at McGill College since June 1, 1888," by Professor C. H. McLeod of McGill University; "Notes on Cream-of-Tartar Analysis," and "Notes on Baking-Powder Analysis," by A. McGill; "Milk Analysis by the Asbestos Method," by Frank T. Shutt; "On a Peculiar Form of Metallic Iron found in Huronian Quartzite on the North Shore of St. Joseph Island, Lake Huron, Ontario," by G. Chr.